The Effect Of Portfolio Asset Size On The Performance Of Australian Superannuation Fund Managers

M. McCrae
University of Wollongong, mccrae@uow.edu.au

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Abstract

Overseas studies suggest a correlation between the performance of mutual fund managers and the size of funds under control, with small funds outperforming large funds. This study extends the analysis to Australian superannuation fund managers where industry structure, purpose, asset base and investment strategies are considerably different. It investigates the potential effect of portfolio asset size on quarterly excess and risk adjusted returns and systematic risk profiles from 1977 to 1993. Although overall performance has weakly improved since the 1970's, the results contradict overseas evidence. After allowing for survivorship bias and extreme outliers, variations in asset size are not related to long term return or risk profile differentials between managers Potential reasons include concentration on short term performance, averaging, window dressing.

Acknowledgments

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1. Introduction

Overseas studies indicate that performance differentials between mutual fund managers may be related to the size of portfolio assets under management, although the results are equivocal (Madden et al 1986, Gallagher 1988, Eaton 1988, Grinblatt and Titman 1989a, Gorman 1991). Several studies also find a consistent relationship between performance and both fund management objectives and fund management style, which tend to suggest that the more aggressive, growth orientated approaches to fund management are associated with the medium to smaller fund portfolios (Brown and Goetzman 1995, Sharpe 1992, Grinblatt and Titman 1989, 1993, Brown, and Goetzman (1995).

Unlike the considerable number of mutual fund studies, the determinants of performance differentials between Australian superannuation fund managers (SFMs) remains relatively unexplored in the academic literature, despite evidence of poor performance in what is, by any standards, a huge investment industry (Bird et al 1986). The only empirical work to date comprises studies by Robson 1981, Leslie 1976, Praetz 1976, Pham and Sim 1991 and Bird et al 1983.

The lack of attention is surprising, given the significance of the superannuation fund industry as an investment sector. The sheer size, growth rate and economic impact of the superannuation industry alone justify investigation of the management and performance of its assets. By June 1995, superannuation fund assets under management in Australia were more than $197 billion, or more than 40 per cent of total personal savings (ABS 1995). The future proportion will increase dramatically due to growth rate differentials between superannuation funds (19 per cent per annum) and other personal savings (10.4 per cent) (Pham and Sim 1990). Estimates of superannuation funds under management by the year 2000 exceed 1000 billion dollars. Under current government policy, compulsory superannuation is to be the major form of retirement income provision for the workforce. Poor performance by superannuation funds implies financial rectitude for millions of Australians upon retirement from the workforce. The issue is of national significance.

Mutual funds are different to pooled superannuation funds as to source of funds, structure, operation, fiduciary legislation and investment strategy. US and Australian mutual funds are more akin to general unit trusts than to true pension funds. American Mutual funds are usually listed on a stock exchange, and provide a return to shareholders on which performance is based. Australian pooled superannuation funds may also be packaged as unit trusts but they are rarely listed on stock exchanges and represent a unique trust category since they come under separate prudential legislation governing the operation, obligation and financial accountability of superannuation funds. The portfolios under the control of managers in this study represent aggregations of separate superannuation funds (typically corporate funds) which managers compete to attract as part of their 'pooled funds' portfolio. Competition between managers for funds is fierce and largely performance driven. Large swings in a manager's asset base can and do occur based on the perceptions of individual fund trustees about relative performance of managers.

Typically, Australian fund managers include much greater exposure to equity and property markets than their European or US pension fund counterparts, and a correspondingly lower investment in fixed interest and bond market securities (Klumpes 1991, Cumby and Glen 1990, Apap and Collins 1994). As a consequence, overseas studies are not necessarily transferable to the Australian context. Similarly, the operation and performance of Australasian equity mutual funds (unit trusts) are also not necessarily comparable to pooled superannuation funds management.

This study is based on a sample of funds and fund managers larger than any previous study and covers a longer time period than previously investigated. These attributes are important in both a conceptual and statistical sense. Unlike unit trusts and other vehicles for personal savings, superannuation is a long term investment which needs to be studied over the longest possible time periods. This study covers sixteen years of quarterly returns. Second, Previous studies worked with valid time series of returns for very small numbers of managers (less than 20 managers). The low sample size made them particularly subject to survivorship bias and criticisms about validity and statistical power. The larger number of qualifying funds and fund managers (1850 and 106 respectively) in this study increases the validity of results and the power of significance tests.

2. Empirical Evidence

Grinblatt and Titman (1989) and Gorman (1991) found associations between size and both the average performance and systematic risk of US mutual funds, although their interpretations of the results differed. Grinblatt and Titman (1989) examined size-return relationships for a sample of 274 funds divided into five size categories for the period 1975-1984. The study also investigated the relationship of expense ratios, management fees and fund turnover to asset size. Their results showed that, gross of expenses, the smallest funds achieved significantly better gross risk adjusted return performance (2.5%) than larger funds.

The concentration of aggressive growth funds among the small fund category may help to explain the inverse relationship between size and gross returns. But even with this factor removed, smaller funds still generated higher returns than larger funds. Consequently, the authors concluded that both net asset value and investment objective are determinants of abnormal performance.

While smaller funds showed superior gross performance, they also incurred the highest transactions costs. The high transactions costs erode the superior returns, so that the net return to investors did not differ from that of the larger funds. Consequently, investors cannot take advantage of superior performance of these smaller fund managers by purchasing shares in their funds.

Gorman (1991) also found that smaller funds achieved higher returns. She then tested whether superior performance came from running portfolios with higher systematic risk profiles by modelling a fund manager's excess returns using the capital asset pricing model with a size variable added . The results showed that higher risk did not completely explain superior performance. Even after allowance for time related variations in beta (short-run versus long-run), the size effect remained. Using an historical beta of 0.8 and weighted least squares estimates, the estimated 12 year return for a $10m fund was 40% higher than for a billion dollar fund.

The negative size effect was explained in three ways. First, lower returns could reflect a large size effect. Investing large blocs of funds requires high capitalisation stocks to avoid price reactions which increase investment costs. Large capitalisation stocks are less costly but may also give less return per investment dollar in comparison to smaller companies which generate higher returns but significantly increasing portfolio risk. Thus smaller funds are likely to run higher return/higher risk portfolios than large funds. Madden et al (1986) found a consistent and significant inverse relationship between mutual fund performance and the market capitalisation (size) of constituent equities.

Second, the size variable may reflect fund purpose. Size is a function of managerial policies, incentive structures and organisational overhead. Compensation schemes of large and small funds place different weights on investment performance. Finally, smaller funds may experience higher returns since personality traits common to successful managers may attract them to small funds through congenial working conditions.

Studies of the potential effects of asset size on performance for Australian superannuation funds managers are limited. Bird, Chin and McCrae (1983) tested for a correlation between fund size and performance based on quarterly rates of return from January 1973 to June 1981 for 15 pooled superannuation fund managers who had continuous returns over the period. They found no significant relationship between fund size and manager performance over the 34 quarters. However, during the second half of the period they found a positive relationship using risk adjusted performance measures and a negative relationship on a non-risk adjusted basis. The smaller funds generated higher returns but ran higher risk portfolios than larger funds.

These results may suffer from survivorship bias since they were based on a sample of only 15 managers with continuous returns over the period. No tests were conducted to ascertain whether the exclusion of non-survivors or managers who operated over only part of the period introduced over-performance bias (Grinblatt and Titman 1995, Garcia and Gould 1993, Brown et al 1992).

This study extends the analysis of Gallagher (1988), Grinblatt and Titman (1989a) and Gorman (1991) on fund performance and portfolio size to the context of Australian SFMs. This study investigates two null hypotheses.

1. $\mathbf{H_0}$: *There is no difference between the excess returns earned by SFMs based on portfolio size.*

2: $\mathbf{H_0}$: *There is no difference between the levels of systematic risk attached to portfolios run by SFMs based on portfolio size.*

3. Method Issues

The problems of evaluating portfolio performance - quantification of risk and 'normal' performance, and errors of inference about actual superior performance - brought increasingly sophisticated performance measures and analytical techniques to bear on the problems (see Lehman and Modest 1987 for a recent survey of issues and articles). Issues particularly associated with the study of size/return relationships include: survivorship bias (Garcia and Gould 1993), sample size, time horizon (Chen and Lee 1986), dis-aggregation, risk adjustments, benchmark inefficiencies and short term beta volatility (Lehman and Modest 1987, Grinblatt and Titman 1992, 1993, 1995, Gorman 1991, Bird et al 1983, Gallagher 1988). This study specifically addresses the problems of bench marking, risk adjustment, survivorship bias, measuring asset size and length of time horizon. These issues are discussed below.

3.1 Benchmarking

The problem of devising proxies for approximating unobservable market returns to act as performance benchmarks has a long history of analysis since Roll's original critique of CAPM based performance testing (Roll 1977, 1978, see Grinblatt and Titman 1992 for a discussion). Grinblatt and Titman (1992) compare the efficiency of four metrics based on the ability of each benchmark to generate zero excess returns for passive, index funds. A similar test between alternative benchmarks is adopted in this study [1].

Unlike European mutual funds, Australian superannuation funds typically have a large proportion of local equity holdings in their portfolios and are thus likely to judge fund performance against the average performance of large stocks in the local equity market or against an equity market index (Bird et al 1983). Selection of a benchmark should account for this investment characteristic, so this study uses the Statex Index which reflects the performance of the Australian equities market. The index is a market weighted, accumulation index; that is, it allows for reinvestment of dividends. Prior to July 1984, SFMs were required to hold 20 per cent of their funds in government securities and an additional 10 per cent in either government or semi-government securities. A composite risk free index is incorporated with the market index for that period to reflect this 20/30 restriction.

3.2 Risk Adjustment

Since portfolio risk profiles may vary between managers, performance comparisons require returns to be adjusted for risk differentials. The CAPM model treats systematic or non-diversifiable risk, as the relevant risk measure between alternative investment portfolios. Several metrics for risk adjustment have been developed, notably the Sharpe (1966), Treynor (1965) and Jensen (1968) measures. Bird et al (1983) found a close association between the risk adjusted returns resulting from three metrics, although some overseas studies record result sensitivity to risk adjustment technique.

The Sharpe and Treynor measures differ only through their risk-adjustment factor. The Sharpe technique standardises a portfolio's excess returns by the total risk (standard

[1] In a later study they developed a benchmark free test (Grinblatt and Titman 1993)

deviation of the returns), while the Treynor technique standardises for systematic risk only and assumes efficient diversification of all unsystematic risk. The Jensen measure is derived from the CAPM equation for required excess returns

$$R_{it} - R_{ft} = \alpha_i + \beta_I (R_{mt} - R_{ft}) + \varepsilon_{it}$$

The Jensen measure of a portfolio's performance is derived from the value of the constant term(given by α_i). Values greater than zero indicates outperformance of the benchmark. Statistical significance of sample values can be directly tested (whether α_I is significantly different from zero). The significance of Treynor and Sharpe values cannot be similarly tested although procedures which circumvent this disadvantage developed by Jobson and Korkie (1981) show the Treynor test lacking in power. The Jensen measure is used in this study.

The study uses two return metrics. The Excess Return (ER) which refers to the average excess return (return - risk free return) for each manager over the period. Excess returns are gross of expenses, with no adjustment for risk. The second measure, the risk adjusted return (JEN), uses the Jensen risk adjustment technique with the modified Statex index (MSI) as the market proxy benchmark. The risk adjustment enables comparison of individual manager's returns after adjusting for different portfolio risk levels run by managers. As is traditional, betas (BETA) are used as a measure of portfolio risk.

3.3 Survivorship Bias

Previous studies of Australian superannuation fund and fund manager performances include only those SFMs surviving throughout the whole time period. This procedure reduces the power of significance tests through low sample sizes. It also introduces the possibility of survivorship bias if the performance of late arrivals or managers with incomplete returns for the period differs significantly from survivors (see Garcia and Gould for a discussion of survivorship bias problems and survey of literature). Restricting samples to survivors may tend to overstate excess returns since non-survivors are more likely to perform poorly in relation to survivors (Garcia and Gould 1993, Brown et al 1992).

Although complete elimination of survivorship bias is difficult, the inclusion of both late arrivals and all managers with more than a set minimum of observed returns may limit its influence. The present study addresses the survivorship bias problem in two ways. First, the average returns were calculated for all individual funds making up a portfolio of 'pooled funds' irrespective of whether they existed throughout the entire period or not. The data set consists of all managers with more than twenty quarterly returns. But, where a pooled fund existed for only part of the period and where the portfolio size was run down prior to termination or amalgamation, it was eliminated from the study. 110 managers satisfied these requirements.

3.4 Measuring Size of Assets under Management

Selection of a suitable metric representing portfolio size is a further problem. Both Grinblatt and Titman (1989) and Gorman (1991) use static measures of beginning portfolio market value as a proxy (Gorman, Grinblatt and Titman), although Bird et al (1983) used average of period start and end market values as their measure of size. But fund size may itself be a time dependent process rather than a static concept (Smith 1978). Small aggressive funds with superior performance may grow quickly into larger funds by the end of the period as they attract investment dollars.

Gorman found that relative size rankings for individual funds changed considerably in terms of comparative percentile rank between 1973 and 1985, mainly through increases in rank by smaller funds. This result highlights the difficulty of defining an appropriate measure of fund size where fund size alters considerably over the period and changes the fund's rank. The value of a manager's portfolio at the start of the period provided a measure of the size metric.

The sixteen year time horizon of this study is long enough to avoid the problem that estimates for returns, betas and size effects may be sensitive to the time horizon used for measurement (Brown, Kleidon and Marsh, 1983, Handa, Kothari and Wasley 1989). The betas used in this study are typically calculated over ten to twenty years so the problems of lack of stationarily in short term betas is avoided in this analysis (Gorman 1990).

4. The Data

The data in this study refers to individual superannuation funds placed under the control of investment managers during the period January 1977 to March 1993. The Sample is taken from the Mercer survey of superannuation funds. The survey provides data on 1853 individual funds pooled under the control of 175 pooled fund managers. The survey provided data on the cash inflows during each quarter and the closing asset value of funds.

The quarterly rates of return for each individual fund are calculated according to the formula in appendix 1. All cash movements are assumed to occur, on average, in the middle of the month. Second, the potential disadvantage to fast growing funds (relative to static funds) of initial investment costs for new contributions are offset by a 1.015 factor included in the market value term. The quarterly rates of return are calculated gross of all management charges and transactions costs except as noted above. Returns are net of taxes since all funds included in the survey qualify for tax exemption as superannuation funds. The return achieved by a manager in any quarter is then calculated as a value weighted average of the returns to each fund in the portfolio. Decomposition and size weighting of individual fund returns produces a more efficient measure of a manager's average return for any particular period.

The study follows Grinblatt and Titman (1989) and Ippolito (1993) in calculating returns gross of all expenses, transactions costs and managers' fees[2]. In addition, the use of actual returns avoids potential problems associated with Grinblatt and Titman (1989) use of hypothetical returns generated from stock exchange annual price data for listed funds.

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[2] Except for an adjustment for transactions costs of investing new funds flowing into the fund during a period, so as not to disadvantage rapidly growing funds.

5. Results

5.1 Size Ranking Movements

The size of pooled superannuation funds varies greatly between the managers and over time. In 1973 the smallest fund was $1,690,772 and the largest was $403,135,484. By 1993 the smallest portfolio under management was $822,823,142, compared with the largest portfolio of $3,230,519,961. Other descriptive statistics of the size parameters are also given in Table 1).

TABLE ONE ABOUT HERE

A plot of the percentile ranking for each SFMs asset size in 1977 against its rank in 1993 show that the relative size ranking of portfolios for the majority of managers remains fairly consistent over the period (Figure 1). But the pattern has considerable dispersion with numbers of outliers of funds in both directions - low ranked SFMs in 1977 which increased their ranking and larger funds in 1977 which decreased their ranking. Notable are three SFMs in the less than 10th percentile in 1977 which increased to the 90+ percentile in 1993.

FIGURE ONE ABOUT HERE

5.2 The Effects of Outliers

Initial observations of the scatterplots for total return and risk-adjusted returns (Figures Two and Three) indicated an overall similarity in average values for both return metrics irrespective of pooled fund size with the presence of several extreme outliers which did not appear to be representative of the general lack of trend in the data.

FIGURES TWO AND THREE ABOUT HERE

Wilson (1996) points out that an important implicit assumption of linear regression models is that each data point exert equal influence upon parameter estimates of the OLS model. Undue influence on parameter estimates may be exerted by extreme outliers which are not representative of the average performance of the underlying entity. Such distortions may be caused by intrinsic factors such as takeovers and mergers or by errors in the data. Inclusion of such extreme observations may lead to statistically significant, but irrelevant, parameter estimates, since they are based on sample data which do not truly represent the average behaviour of the underlying entities. A small number of unrepresentative data points may drive the parameter estimates resulting in biased or invalid conclusions about the model's validity, completeness and explanatory power and about correlations between variables.

Removal of unrepresentative observations may improve model specification. But not all outliers exert undue influence. Where extreme observations do not exert undue influence on parameter estimation, they constitute a statistically valid part of the data set and there is no theoretical reason for excluding them. Such procedures as ad hoc exclusion of selected outliers with greatest absolute deviation or winsorising the sample data set may remove extreme, but valid observations while preserving less extreme observations which do exert undue influence.

Close inspection of individual fund series found that four of the outliers were subject to intrinsic factors which made them unrepresentative of the sample as a whole. But, as noted, merely excluding them on an ad hoc basis is unsatisfactory. All outliers were investigated using Cook's Distance (Weisberg 1985) as a statistical diagnostic test to determine any undue influence from return outliers. This procedure also identified the four return outliers as exerting a significant influence upon the parameter estimates (fund managers 108, 109, 110 and 5). These are eliminated in two rounds (Table 2). All subsequent analysis is conducted on the modified sample set of 106 managers.

TABLE TWO ABOUT HERE

5.3 General Performance of Managers

The results on the overall performance of managers are broadly in line with previous studies. Managers overall fail to equal the risk adjusted returns of a passive buy and hold strategy based on the market index (Table 3). Bird et al (1983) found that for the period 1973 to 1981, superannuation fund managers had failed to keep up with the returns from the market index. Their performance improved in the second half from about 1975 but this was insufficient to offset earlier poorer performance (p. 59). We re-ran their binomial test to test the proposition that the median performance of the managers was not significantly different from that of the composite market index used in this study (Table 3). On both the non-risk adjusted and risk adjusted returns the proposition was rejected. For risk adjusted returns the lower bound of .49 being less than .50. On non-risk adjusted returns, all but three managers failed to emulate market returns at a lower bound of 0.013.

TABLE THREE ABOUT HERE

The results confirm Bird's overall finding of poor performance since the median performance is still significantly below market returns. They may provide weak support for the continuation of the performance improvement noted in the latter half of their period (1975 - 1983) since an increased proportion of managers (43 out of 106 managers) are able to emulate market returns on a risk adjusted basis. Nevertheless, few fund managers can generate risk adjusted, average quarterly returns that will outperform a passive buy and hold policy based on the market index.

Initial tests of the two hypotheses come from running linear regressions of asset size on each of the three risk/return parameters (ER, JEN, BETA) using the modified data set of 106 managers[3]. The regression correlation coefficients, coefficients and associated probabilities on t-tests show no significant correlation between opening fund size and risk-adjusted returns (JEN) or non-risk adjusted returns (ER) or systematic risk (BETA) (Table 4). The first null hypothesis associating quarterly return measures with fund size cannot be reject at conventional levels of significance. The second null hypothesis associating systematic risk profiles with fund size is likewise rejected.

[3] Several different regression forms were fitted - log, quadratic, hyperbolic - but the linear form gave the highest explanatory value.

TABLE FOUR ABOUT HERE

To emulate the Bird et al (1983) study, the regressions of size against performance measures were re-run using the average of the beginning and ending period market values of the SFM's portfolios as an alternative size metric. Although not reported here, no significant difference occurs for any of the metrics based on conventional levels of significance. This points to a potential weakness in the Bird study. Since no allowance for survivorship bias or extreme outliers was made, their finding of significant differences between large and small fund manager performance in the latter half of the study (1978-1982) may reflect the influence of extreme outliers[4].

5.4 Tests on Quartiles

Gorman tested for size related performance differentials between managers by comparing the average returns for upper and lower size quartiles. She concluded that managers with small portfolios generated higher excess returns than large fund managers, even after allowing for risk. Quartile analysis of Australian data shows no significant differences. The lack of relationship between size and performance observed in the general regression analysis is confirmed by a comparison of the average risk/return values for the upper and lower quartiles of SFM size (Table 5). No significant differences are found in the quartile averages for either excess returns (ER), risk-adjusted returns (JEN), or long run systematic risk (BETA). Neither null hypothesis could be rejected at conventional levels of significance.

TABLE 5 AND 6 ABOUT HERE

The evidence in this study does not suggest that Australian SFMs with smaller portfolio values earn higher excess returns than managers running larger portfolios nor do they run higher risk portfolios. The lack of significant differences in risk adjusted returns or systematic risk between upper and lower quartiles also meant that Gorman's investigation

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[4] The sensitivity of superannuation fund performance analysis to survivorship bias is currently under investigation by the author..

of systematic risk as an incomplete explanation of performance differentials became irrelevant.

There are, however, significant differences in return volatility. The average dispersion of returns for small fund managers is significantly larger than for large portfolio managers for both no-risk adjusted and risk adjusted returns (Table 6). This implies that the naive investor with no prior knowledge, who is selecting a manager at random, is more likely to pick a manager with 'about average' excess returns and systematic risk from among the larger funds than from among the smaller funds.

6. Discussion

The size effect observed in several overseas studies of mutual funds is not reflected in the data for returns generated by Australian superannuation fund managers or the systematic risk of portfolios. After allowing for survivorship bias, and the effect of extreme outliers, a comparison of the largest and smallest funds does not reveal any significant differences in average returns or systematic risk profiles. Smaller funds do not appear to generate significantly greater excess returns or run portfolios with higher levels of systematic risk, although smaller funds do appear to be more volatile in their returns than the larger funds, both within quarterly returns for a manager and between period returns for individual managers. This result suggests that, given the high volatility of quarterly returns for most managers, a naive investor seeking to place funds with a manager would be more likely to hit upon an 'about average' performing manager within the larger funds.

These contradictory results are surprising given the strength of arguments supporting superior performance of small funds. Reasons include the flexibility of investment strategy afforded by small size and the potential for investment in high return, small capitalisation stock, the likely concentration of aggressive investment approaches and allowance for idiosyncratic management styles among the smaller fund managers, and the investment performance 'life cycle' of managers noted by Troutman (1991) which may be size related. Smaller asset bases allow managers the flexibility to follow their own (aggressive) strategies and to alter investment strategy to suit different phases of the market cycle. They suit an active, hands on management approach free of large administrative and hierarchical structures. Larger asset bases mean less flexibility, more interference, turn the manager into an administrator and limit investment opportunities.

One possible explanation for the homogeneity of performance, even on a risk adjusted basis may lie in the concentration on short term performance which has so far dominated the industry. Managers, anxious to retain market share and reputation, focus on monthly or yearly performance in relation to other fund managers. While superior performance is desirable, the avoidance of bad yearly performance relative to other managers is a stronger incentive. Given the well established difficulty of consistently outperforming market indexes, the safest strategy for managers is passive index tracking portfolios. Superior long term performance implies accepting the volatility of short term returns - a penalty which most superannuation fund managers are unwilling to accept.

A complicating factor may lie in a two way interaction effect between performance and asset size. Managers with superior performance are likely to increase their size ranking over the period as they attract more funds relative to managers with lower performance. But as the size of assets to be invested becomes larger it may be difficult to sustain superior performance which then declines towards the industry average. Asset size may also be a function of performance.

A third explanation may be 'performance window-dressing'. Like overseas funds, Australian SFM's may attempt to mask poor performance by smoothing returns over time by various means. These include 'real' decisions such as timing of investment decisions and 'artificial' means such as discretionary accounting choices. (Lakonishok et al 1994). Several of the largest funds also indulge in performance averaging over separate pooled funds. A factor which further masks both performance and risk differentials of any one manager. The strength of these imperatives may outweigh or mask those size effects observed overseas in relation to mutual funds.

Finally, studies of mutual funds show a lack of persistence performance by managers. Above average performance in the past is no indication of future performance. Today's high flyer is just as likely to be tomorrow's average performer.

Given the lack of relationship between size and performance differentials the obvious extension is to explore other factors identified in other studies as potential drivers of performance. Analysis based on classifications of management style and the aggressive/passive nature of investment strategy are currently being explored by the author along with the question of the direction of overall performance by managers. The persistence of overall poor performance in the long term by managers alluded to in this study is of real concern both in a market efficiency context and in its wider social implications. Further investigation is needed along with sensitivity analysis of results to measurement factors such as survivorship bias, length of time horizon and performance in alternative market conditions. A related issue is the need for critical review of the inordinate weight placed upon return metrics as a composite measure of performance disclosure.

Table 1

Asset Size under Management, Lower and Upper Quartiles,

1977 and 1993 (n=110, q1 = 27, q2 = 27).

	Lower Quartile			**Upper Quartile**		
	1977	**1993**	**% inc**	**1977**	**1993**	**% inc**
Mean	776483	25555521	32.91	105649252	328528690	3.11
Median	637561	3617674	5.67	40035578	93898312	2.35
Std Dev	481881	79108535		182935519	646086079	
Kurtosis	-0.5560	21.8356		11.0534	16.5190	
Skewness	0.6217	4.5460		3.2608	3.8025	
Range	1690772	403135484		822823142	3230519961	
Minimum	69228	17220		24007770	1898039	
Maximum	1760000	403152704		846830912	3232418000	

Table 2

Cook's Distance Measure for Ranked Outliers

Round 1		
Manager #+	**CD**	
109	0.79953	**
108	0.28738	**
5	0.11611	*
Round 2		
110	27.84000	**

+ Managers ranked by extreme return observations
** significant at the .05 level
* significant at the .10 level.

Table 3

Performance of Managers (Market weighted) relative to Average Market

Returns 1977 - 1993 (n=106 managers)

		(binomial test)	
ER	3.7856	+ 3, -103	(2.448E-27, 0.013)
JEN	0.0307	+43, -63	(0.03223, 0.49)
BETA	0.4387		
Market Return	4.3120		
Std Dev	10.1190		
Risk Free Rate	2.9383		

Note: + = outperformed index
- = outperformed by index

Figures in parenthesis represent cumulative probabilities and lower bounds implied by observed outcomes.

Table 4

Correlation Between Asset Size and Return/Risk,

1977 - 1993, (n=106 managers)

	Correl Coe	Tvalue	P(t)
ER	0.149355	-1.5478	0.1247
BETA	0.056068	-0.57687	0.5681
JEN	0.073224	-0.75234	0.4535

Table 5

Comparison of Return/Risk, Upper and Lower Quartiles,

1977 - 1993 (n=106, q_L=26, q_U = 26)

Parameter	Lower Qrtle Average	Upper Qrtle Average	T Value	P(t)
ER	3.957407	2.787905	1.478136	0.146186
JEN	0.197704	-0.13086	0.532532	0.596921
BETA	0.413593	0.40781	0.05771	0.95423

Table 6

Comparison of Volatility, Upper and Lower Quartiles,

1977 - 1993 (n=106, q_1=26, q_2=26)

Parameter	Small Funds std dvn	Large Funds std dvn	F-Test of Var F Ratio	Sig Level
ER	1.4007	1.8109	1.6715	.2061
JEN	2.3904	1.9473	1.5068	.5026
Beta	0.3724	0.2244	2.7529	.0144

Figure 1:
Asset size Percentiles, 1977 and 1993

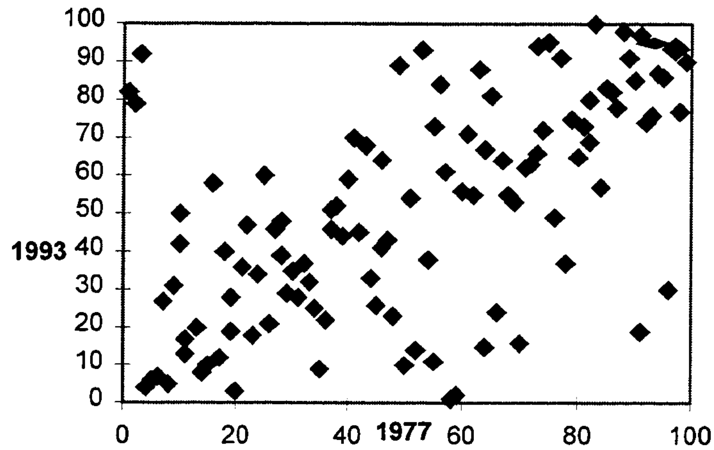


Figure 2:
opening asset size versus nra return

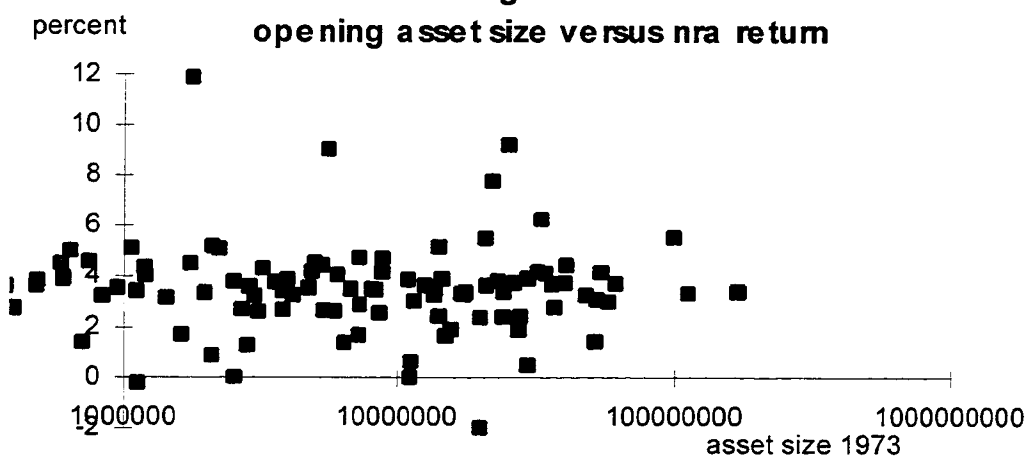
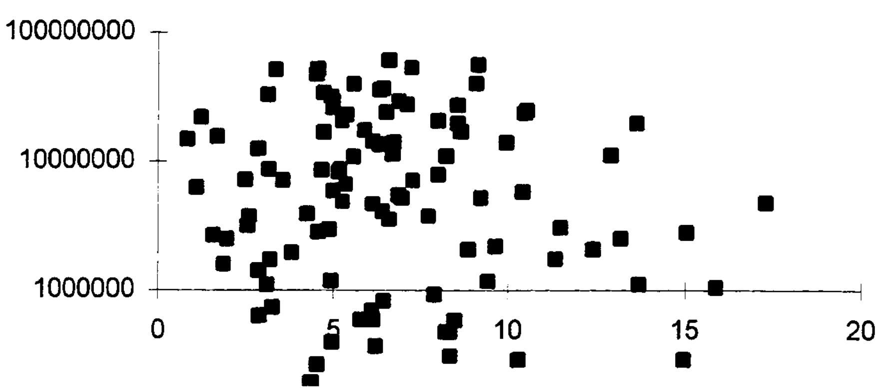


Figure 3:
1977 size versus unadj std dev 1977-1993



Appendix 1

Quarterly Return calculation formula

$$R_{it} = \frac{1.015\ MV_{it} - (1.015\ MV_{i,t-1} + C_{i1} + C_{i2} + c_{i3})}{1.015\ MV_{i,t-1} + 5/6\ C_{i1} + 1/2\ c_{i2} + 1/6\ C_{i3}}$$

where

R_{it}	fund I rate of return in quarter t;
MV_{it}	end quarter market value of fund i's assets;
$MvV_{,t-1}$	beginning quarter market value of fund i's assets;
$C_{i1,I2,I3}$	net inflow of funds into fund I in first, second and third months of the current quarter.

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